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(54) **ELECTRIC TOOTHBRUSH**

2004/0227418 A1\* 11/2004 Kim ..... 310/81  
2006/0156496 A1\* 7/2006 Häfliger et al. .... 15/22.1  
2009/0091178 A1 4/2009 Waguespack et al.  
2011/0289703 A1 12/2011 Häfliger et al.

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**FOREIGN PATENT DOCUMENTS**

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 165 days.

CN	1762309	A	4/2006
CN	201320225	Y	10/2009
JP	2002-45379	A	2/2002
KR	10-2007-0069446	A	7/2007

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**OTHER PUBLICATIONS**

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Office Action dated Sep. 14, 2010 in Korean Application No. 10-2010-0032374, filed Apr. 8, 2010.

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US 2011/0247153 A1 Oct. 13, 2011

\* cited by examiner

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(57) **ABSTRACT**

(52) **U.S. Cl.**  
USPC ..... 15/22.1; 15/22.2

Disclosed is an electric toothbrush including a toothbrush plate having a cleaning brush installed thereon; a toothbrush head having a storage within which the toothbrush plate is stored; a toothbrush body that is connected to the toothbrush head and has a storage space formed therein; a flat type vibration motor that is disposed between the toothbrush plate and the toothbrush head; and a power supply unit that includes a power supply that is disposed in the storage space of the toothbrush body and supplies the vibration motor with power, a power supply switch connected to the power supply and a wire that is electrically connected to the vibration motor and the power supply switch and supplies the vibration motor with power.

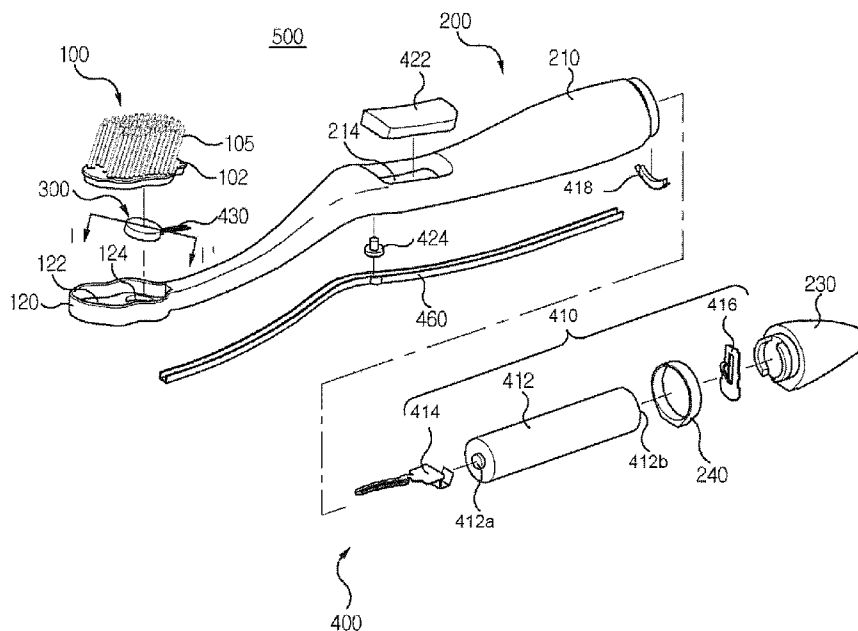
(58) **Field of Classification Search**  
USPC ..... 15/22.1, 22.2, 23, 28, 21.1, 22.3, 15/22.4  
See application file for complete search history.

(56) **References Cited**

**18 Claims, 2 Drawing Sheets**

U.S. PATENT DOCUMENTS

3,060,474	A *	10/1962	Woog	.....	15/22.1
4,235,253	A *	11/1980	Moore	.....	132/322
8,156,599	B2 *	4/2012	Waguespack et al.	.....	15/104.94
2002/0120991	A1 *	9/2002	Cacka et al.	.....	15/22.1



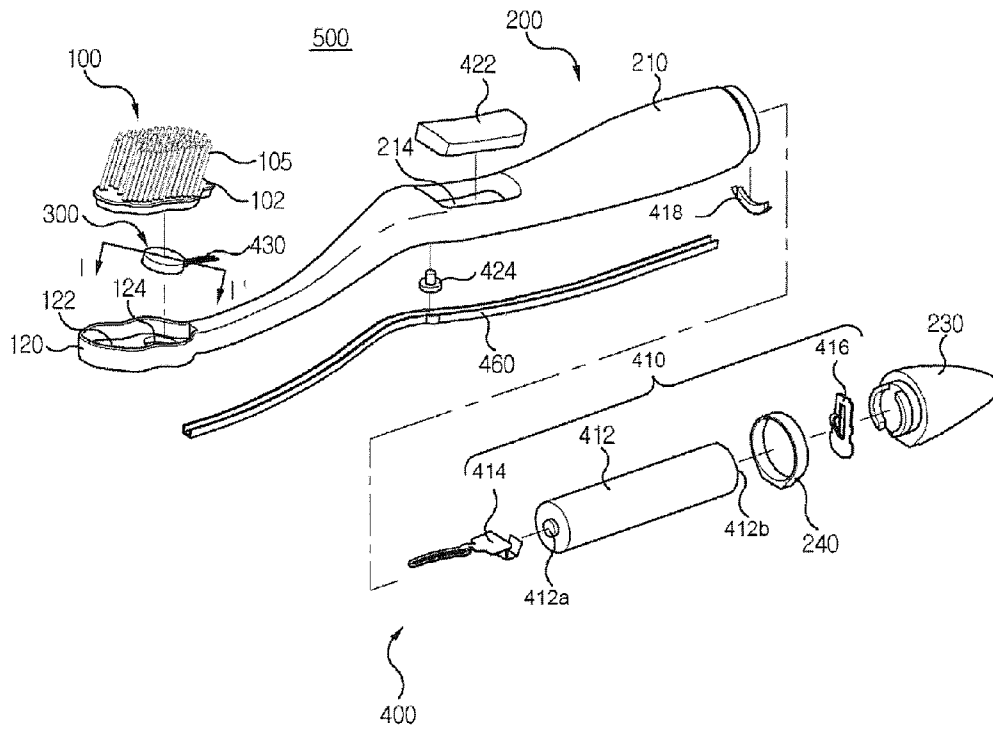


FIG. 1

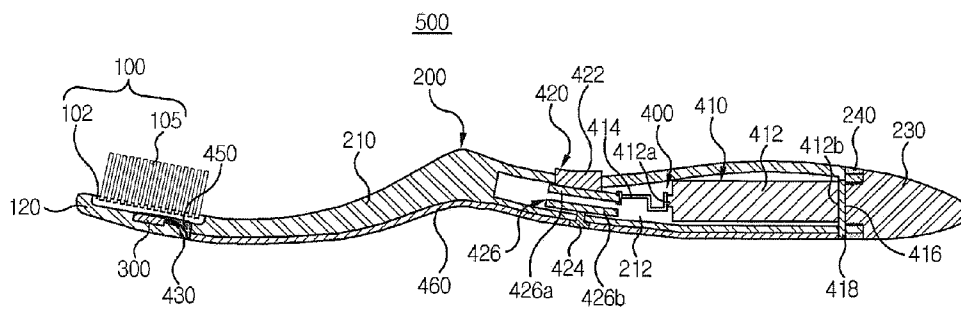


FIG. 2

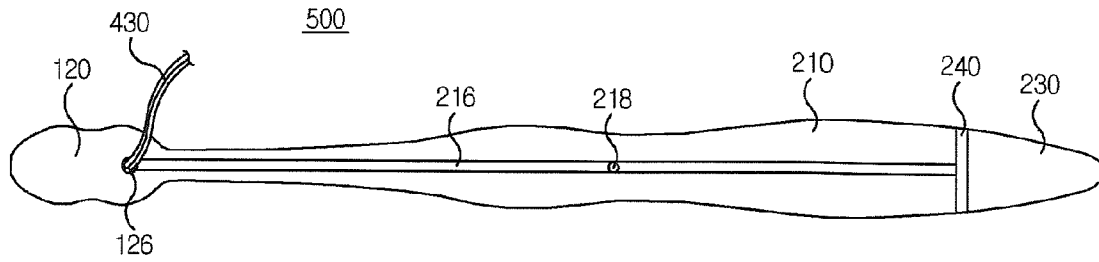


FIG. 3

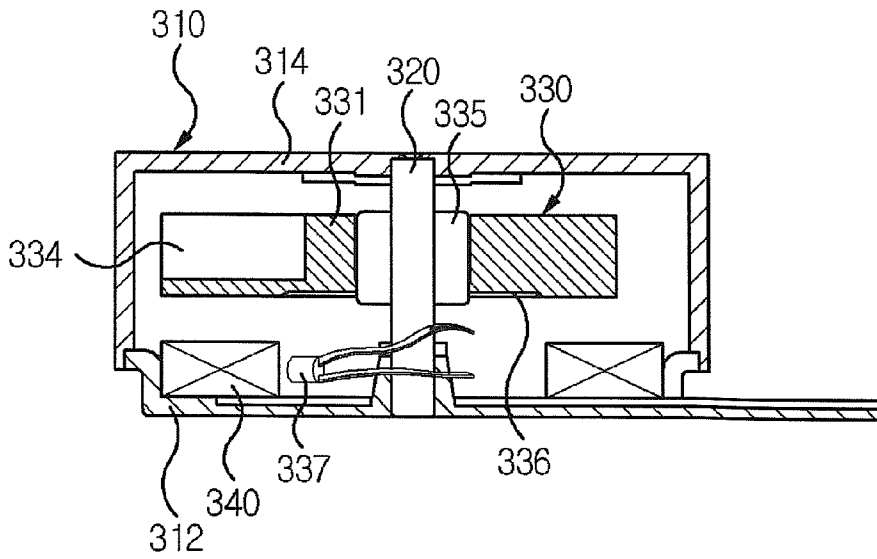


FIG. 4

## ELECTRIC TOOTHBRUSH

This application claims the benefit under 35 U.S.C. §119 of Korean Patent Application No. 10-2010-0032374, filed on Apr. 8, 2010, which is hereby incorporated by reference in its entirety.

## BACKGROUND OF THE DISCLOSURE

## 1. Field of the Invention

The present disclosure relates to an electric toothbrush.

## 2. Description of Related Art

Generally, a toothbrush including a handle and a cleaning brush is formed with a plastic material. The toothbrush removes foreign substances and tartar (scale or dental calculus) from teeth by moving a user's wrist or arm.

Recently, an electric toothbrush is being increasingly used, which uses rotation and vibration of a motor in order to maximize effect of tooth brushing, i.e., to remove foreign substances or tartar from teeth using a toothbrush, and to make tooth brushing easy.

However, an electric toothbrush developed recently has a driving motor in its handle so that vibration generated by the driving motor embedded in the handle is not efficiently transferred to a cleaning brush. It is therefore difficult to efficiently remove the foreign substances and tartar from teeth.

## BRIEF SUMMARY

The present disclosure provides an electric toothbrush, capable of directly vibrating a cleaning brush to obtain a high vibration on the cleaning brush, thereby efficiently removing foreign substances and tartar from teeth.

The technical problems to be solved by the present disclosure are not limited to the above technical problem, and other technical problems will be understood by those skilled in the art from the description below.

In an embodiment of the present disclosure, an electric toothbrush includes a toothbrush plate having a cleaning brush installed thereon; a toothbrush head having a storage within which the toothbrush plate is stored; a toothbrush body that is connected to the toothbrush head and has a storage space formed therein; a flat type vibration motor that is disposed between the toothbrush plate and the toothbrush head; and a power supply unit that includes a power supply that is disposed in the storage space of the toothbrush body and supplies the vibration motor with power, a power supply switch connected to the power supply and a wire that is electrically connected to the vibration motor and the power supply switch and supplies the vibration motor with power.

According to the electric toothbrush of the present disclosure, there is an advantageous effect that foreign substances and tartar can be removed from teeth by disposing a flat type vibration motor between a toothbrush plate having a cleaning brush installed thereon and a toothbrush head and by vibrating the cleaning brush directly from underneath the toothbrush plate.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exploded perspective view of an electric toothbrush according to an embodiment of the present disclosure;

FIG. 2 is a sectional view of the electric toothbrush illustrated in FIG. 1;

FIG. 3 is a view illustrating a bottom side of the electric toothbrush illustrated in FIG. 1; and

FIG. 4 is a sectional view of the vibration motor illustrated in FIG. 1, taken along line I-I'.

## DETAILED DESCRIPTION

Hereinafter, embodiments of the present disclosure will be described with reference to the accompanying drawings. In this procedure, size and shape of the components shown in the drawings may be exaggerated for the sake of clarity and convenience. Further, terms that are specifically defined in consideration of construction and operation of the present disclosure may be changed according to operator's intention or custom. Definition of such items should be made on the basis of entire contents of the specification.

FIG. 1 is an exploded perspective view of an electric toothbrush according to an embodiment of the present disclosure; FIG. 2 is a sectional view of the electric toothbrush illustrated in FIG. 1; and FIG. 3 is a view illustrating a bottom side of the electric toothbrush illustrated in FIG. 1.

Referring to FIGS. 1 to 3, the electric toothbrush 500 includes a toothbrush plate 100, a toothbrush head 120, a toothbrush body 200, a vibration motor 300, and a power supply unit 400. In addition, the electric toothbrush 500 includes a waterproof member 450 (refer to FIG. 2), and a sealing member 460.

The toothbrush plate 100 includes a base plate 102 to be described, that is formed correspondingly to the toothbrush head 120 and a cleaning brush 105 that is installed on the base plate 102 and removes foreign substances and tartar from teeth.

The toothbrush head 120 stores the toothbrush plate 100 and fixes it thereto. The toothbrush head 120 has a storage 122 being a concave groove to store the toothbrush plate 100, which is formed in the upper side of the toothbrush head 120, the upper side facing the base plate 102. A vibration motor storage groove 124 to be described that stores the vibration motor 300 is formed on the bottom of the storage 122.

The toothbrush head 120 has a wire discharge hole 126 formed as illustrated in FIG. 3.

The toothbrush plate 100 is fixed to the storage 122 of the toothbrush head 120 using an adhesive member or the like.

The toothbrush body 200 has a rod shape, which is integrally formed with the toothbrush head 120, and the toothbrush body 200 includes a first housing 210, a second housing 230 and a sealing holder 240.

The first housing 210 is defined as a portion gripped by a user's hand when a user brushes teeth, and one end of the first housing 210 is integrally formed with the toothbrush head 120.

A storage space 212 to be described that stores a power supply unit 400 is arranged in the first housing 210, which is formed from the middle of the first housing 210 to the end of the first housing 210 along longitudinal direction of the first housing 210.

A first button inserting hole 214 connected to the storage space 212 is formed on the top side of first housing 210 below which the storage space 212 is formed.

A wire storage groove 216 extending from a wire discharge hole 126 to the other end of the first housing 210 is formed on the bottom side of the first housing 210 that faces the top side of the first housing 210.

A second button inserting hole 218 is formed in a portion of the wire storage groove 216 corresponding to the first button inserting hole 214, which is also connected to the storage space 212.

The second housing **230** is thread-engaged with the other end of the first housing **210** so that it closes the storage space **212** of the first housing **210**.

The sealing holder **240** is inserted between the first and second housings **210** and **230** so that it prevents water from being flown into the storage space **212** of the first housing **210**.

FIG. **4** is a sectional view of the vibration motor illustrated in FIG. **1**, taken along line I-I'.

Referring to FIG. **4**, the vibration motor **300** includes a flat type vibration motor, for example, and is disposed in a vibration motor storage groove **124** of the toothbrush head **120** to directly vibrate a cleaning brush **105** of the toothbrush plate **100**. The vibration motor **300** includes a case **310**, a rotational axis **320**, a rotor **330** and a magnet **340**.

The case **310** is formed in a coin shape, including a first case **312** and a second case **314** that is engaged with an upper portion of the first case **312**. When the first and second cases **312** and **314** are engaged with each other, an empty space is formed in the first and second cases **312** and **314** to store the rotational axis **320**, rotor **330** and magnet **340** therein.

The rotational axis **320** is vertically disposed in the case **310**. One end of the rotational axis **320** is rotatably engaged with the center of the bottom surface of the first case **312**, and the other end of the rotational axis **320** is rotatably engaged with the center of the upper side of the second case **314** that faces the bottom side of the first case **314**.

The rotor **330** is fixed to the rotational axis **320** to be eccentric thereto, including a molding **331**, a weight (not shown) and a pair of coils **334**.

The molding **331** is formed in a disc shape and has a bearing **335** engaged in its center. Openings are formed around the bearing **335** to store the pair of coils **334** and a weight is disposed in the molding **331** to be eccentric thereto.

The weight is fixed to the rotational axis **320** to be eccentric thereto and generates a vibration when the rotational axis **320** rotates by a magnetic field that is generated by an interaction between the coil **334** and a magnet **340** to be described.

The coil **334** is wound around the weight **332** to generate a magnetic field needed to rotate the rotational axis **320**.

The magnet **340** is formed in a doughnut shape and disposed on the bottom side of the first case **312** correspondingly to the coil **334**. The magnet **340** rotates the rotational axis **320** by an inter-magnetic field interaction with the coil **334**.

A reference numeral **336** in FIG. **4** denotes a commutator circuit board, and a reference numeral **337** denotes a brush, which is electrically connected to the commutator circuit board **336**. In an embodiment of the present disclosure, the flat type vibration motor **300** may be formed in a brushless type.

In an embodiment of the present disclosure, construction and structure of the vibration motor **300** may be variously changed other than the vibration motor **300** illustrated in FIG. **4**, and the embodiment of the present disclosure does not restrict the construction and structure of the vibration motor **300**.

Referring to FIGS. **1** and **2** again, the power supply unit **400** is disposed in the storage space **212** of the toothbrush body **200** and supplies power to the vibration motor **300**. The power supply unit **400** includes a power supply, a switch and a wire.

A power supply **410** includes a battery **412**, an anode plate **414** and cathode plates **416** and **418**.

The battery **412** supplies power needed to drive the vibration motor **300**. An anode terminal **412a** is formed on one side of the battery **412** and a cathode terminal **412b** is formed on the other side of the battery **412**. In an embodiment of the

present disclosure, the battery **412** may be a nickel-cadmium battery, a nickel-hydrogen battery and a lithium ion battery.

The anode plate **414** is electrically in contact with the anode terminal **412a** of the battery **412**.

The cathode plates **416** and **418** include a first cathode plate **416** and a second cathode plate **418**. The first cathode plate **416** is fixed to one end of the second housing **230** that is flown into the storage space **212** of the toothbrush body **200**. Accordingly, when the second housing **230** is engaged with the first housing **210**, the first cathode plate **416** is electrically in contact with the cathode terminal **412b** of the battery **412**.

The second cathode plate **418** is disposed in a thread engaging portion of the first housing **210**. When the second housing **230** is thread-engaged with the first housing **210**, the second cathode plate **418** is electrically in contact with the first cathode plate **416** fixed to the second housing **230**.

The power supply switch **420** is disposed ahead of the power supply **410** in the storage space **212** of the toothbrush body **200**, and forms a closed circuit together with the vibration motor **300**, the power supply **410** and a wire to be described in order to supply power to the vibration motor **300**.

The power supply switch **420** includes a first switch contact button **422**, a second switch contact button **424** and a switch **426**.

The first switch contact button **422** is inserted into a first button inserting hole **214** formed in the first housing **210** and the second switch contact button **424** is inserted into a second button inserting hole **218** formed in the first housing **210**.

The switch **426** is disposed between the first and second switch contact buttons **422** and **424**, and the switch **426** includes a first switch **426a** and a second switch **426b**.

The first switch **426a** is a thin metal plate, which is disposed under the first switch contact button **422** and is electrically connected to the anode plate **414**.

The second switch **426b** is a thin metal plate, which is detached from the first switch **426a** and is disposed on the second switch contact button **424**.

When the first and second switch contact buttons **422** and **424** are pushed using user's thumb and forefinger, the first and second switches **426a** and **426b** are in contact with each other by a pressure applied to the first and second switch contact buttons **422** and **424** and then form an electrical closed circuit.

Referring to FIGS. **2** and **3** again, the wire **430** connects the vibration motor **300** and the power supply unit **400** with each other and supplies power needed to drive the vibration motor **300**. The wire **430** includes an anode wire and a cathode wire.

The anode wire electrically connects the vibration motor **300** and the second spring with each other, and the cathode wire **434** electrically connects the vibration motor **300** and the second cathode plate **418** with each other.

The anode and cathode wires both connected to the vibration motor **300** are fetched out of the toothbrush head **120** through the toothbrush discharge hole **126** formed in the toothbrush head **120** and then stored in a wire storage groove **216** formed in the toothbrush body **200**.

Referring to FIG. **2** again, a waterproof member **450** is formed to cover around the motor storage groove **124** including the vibration motor **300** in order to prevent water from flowing into the vibration motor **300** fixed to the vibration motor storage groove **126**.

Referring to FIGS. **1** and **2** again, the sealing member **460** formed correspondingly to the wire storage groove **216** is inserted into the wire storage groove **216** including the wire discharge hole **126**. The sealing member **460** prevents water from flowing into the vibration motor **300** through the wire discharge hole **126** and into the storage space **212** of the toothbrush body **200** through the wire storage groove **216**.

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According to the detailed description given above, the flat type vibration motor is installed between the toothbrush plate having the cleaning brush installed thereon and the toothbrush head so as to vibrate the cleaning brush directly from underneath the toothbrush plate, thereby sufficiently obtaining a vibration needed to remove foreign substances and tartar from teeth.

Hereinbefore, while the embodiments of the present disclosure are described, they are exemplary ones only and one of ordinary skill in the art may recognize that various alterations and modifications that fall within the scope of the present disclosure may be possible. Accordingly, the true technical protection scope of the present disclosure should be defined by the following claims.

What is claimed is:

1. An electric toothbrush, comprising:
  - a toothbrush plate having a cleaning brush installed thereon;
  - a toothbrush head having a storage within which the toothbrush plate is stored;
  - a toothbrush body that is connected to the toothbrush head and has a storage space formed therein;
  - a flat type vibration motor that is disposed between the toothbrush plate and the toothbrush head;
  - a power supply unit that includes a power supply that is disposed in the storage space of the toothbrush body and supplies the vibration motor with power, a power supply switch connected to the power supply and a wire that is electrically connected to the vibration motor and the power supply switch and supplies the vibration motor with power; and
  - a wire storage groove to store the wire, wherein the wire storage groove is formed on the surface of the toothbrush body and is engaged with a sealing member to seal the wire storage groove.
2. The electric toothbrush according to claim 1, wherein the toothbrush head has a vibration motor storage groove to store the vibration motor.
3. The electric toothbrush according to claim 1, further comprising an adhesive member to glue the toothbrush head and the toothbrush plate together.
4. The electric toothbrush according to claim 1, further comprising a waterproof member to cover and protect the vibration motor.
5. The electric toothbrush according to claim 1, wherein the vibration motor is formed in a flat coin shape.
6. The electric toothbrush according to claim 1, wherein the power supply switch includes:
  - a first switch contact button disposed in the toothbrush body;
  - a second switch contact button disposed in the toothbrush body and facing the first switch contact button; and
  - a switch portion that is disposed in the storage space of the toothbrush body and is electrically connected by a pressure applied to the first and second switch buttons.
7. An electric toothbrush, comprising:
  - a toothbrush plate having a cleaning brush installed thereon;
  - a toothbrush head having a storage groove within which the toothbrush plate is stored and a vibration motor storage groove within which the vibration motor is stored;
  - a toothbrush body that is connected to the toothbrush head and has a storage space formed therein;
  - a flat type vibration motor that is disposed between the toothbrush plate and the toothbrush head;
  - a power supply unit that includes a power supply that is disposed in the storage space of the toothbrush body and

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- supplies the vibration motor with power, a power supply switch connected to the power supply, and a wire that is electrically connected to the vibration motor and the power supply switch and provides the vibration motor with power;
  - an adhesive member to glue the toothbrush head and toothbrush plate together; and
  - a wire storage groove to store the wire, wherein the wire storage groove is formed on the surface of the toothbrush body and is engaged with a sealing member to seal the wire storage groove.
8. The electric toothbrush according to claim 7, further comprising a waterproof member to cover and protect the vibration motor.
  9. The electric toothbrush according to claim 8, wherein the vibration motor is formed in a flat coin shape.
  10. The electric toothbrush according to claim 9, wherein the power supply switch includes:
    - a first switch contact button disposed in the toothbrush body;
    - a second switch contact button disposed in the toothbrush body and facing the first switch contact button; and
    - a switch portion that is disposed in the storage space of the toothbrush body and is electrically connected by a pressure applied to the first and second switch buttons.
  11. The electric toothbrush according to claim 7, wherein the vibration motor includes:
    - a case formed in a coin shape;
    - a rotational axis disposed in the case and in a vertical direction of the case;
    - a rotor that is fixed to the rotational axis to be eccentric to the rotational axis; and
    - a magnet installed in the case.
  12. The electric toothbrush according to claim 11, wherein the rotor includes:
    - a molding formed in a disc shape;
    - a weight installed to the rotational axis to be eccentric to the rotational axis; and
    - a pair of coils that is wound around the weight to generate a magnetic field needed to rotate the rotational axis.
  13. The electric toothbrush according to claim 12, wherein the magnet is formed in a doughnut shape and disposed on the bottom of the case, the magnet being positioned correspondingly to the coil.
  14. The electric toothbrush according to claim 13, wherein the power supply includes:
    - a battery that supplies power needed to drive the vibration motor and has both anode and cathode terminals;
    - an anode plate disposed in a position facing the anode terminal; and
    - a cathode plate disposed in a position facing the cathode terminal.
  15. The electric toothbrush according to claim 14, wherein the battery is a nickel-cadmium battery.
  16. The electric toothbrush according to claim 7, wherein the toothbrush body includes:
    - a first housing that is gripped by a hand when a user brushes teeth;
    - a second housing that is thread-engaged with the other end of the first housing; and
    - a sealing holder that is inserted between the first and second housings so as to prevent water from flowing into the first and second housings.
  17. The electric toothbrush according to claim 16, wherein the first housing includes the storage space to store the power supply unit therein.

18. The electric toothbrush according to claim 17, wherein the first housing has a first button inserting hole formed in an upper side of an area where the storage space is formed.

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